LAKEHEAD UNIVERSITY

GEOLOGY

1971 - 72

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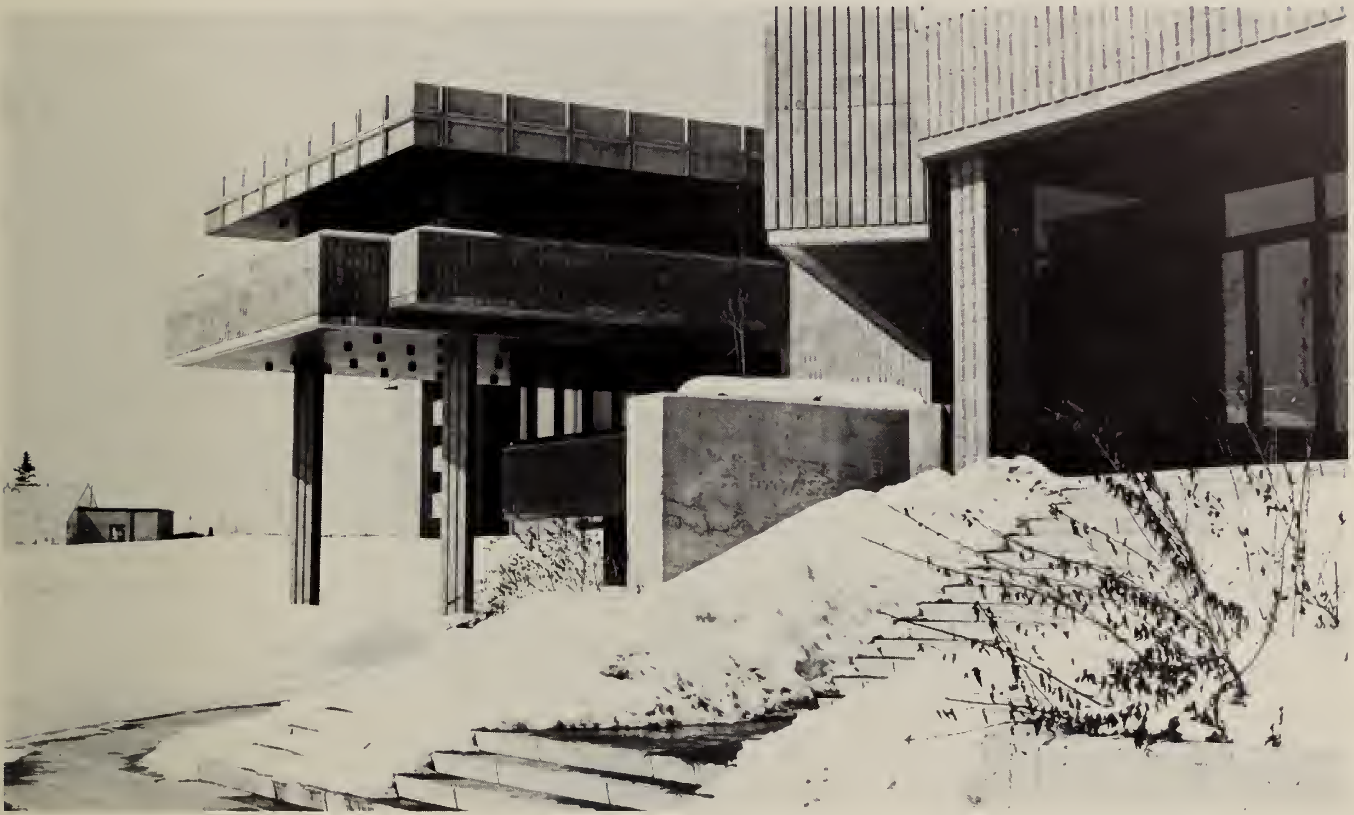


GEOLOGY JOURNAL

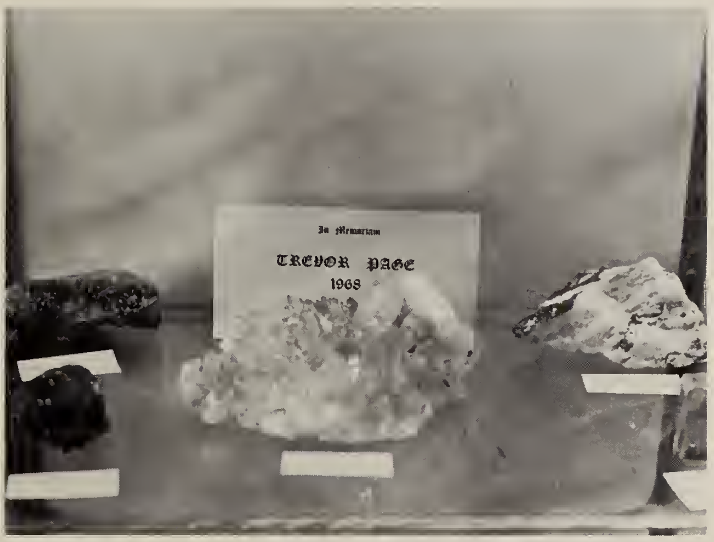
SECOND
EDITION

1971 - 72

EDITOR
DAVE POWERS

CO-EDITOR
RON WRIGLEY

Dedication



It is difficult to know where to begin or to end a dedication to Trevor W. Page. There were so many facets of his career that it is impossible to do justice to all of them.

After graduation from the University of Idaho in 1940, "Trev" enlisted in the R.C.A.F. and impatiently waited for World War II to terminate so he could return to his first love - exploration. He came back to mining after discharge and set out to gain as much varied experience as possible as a prelude to entering the academic circle.

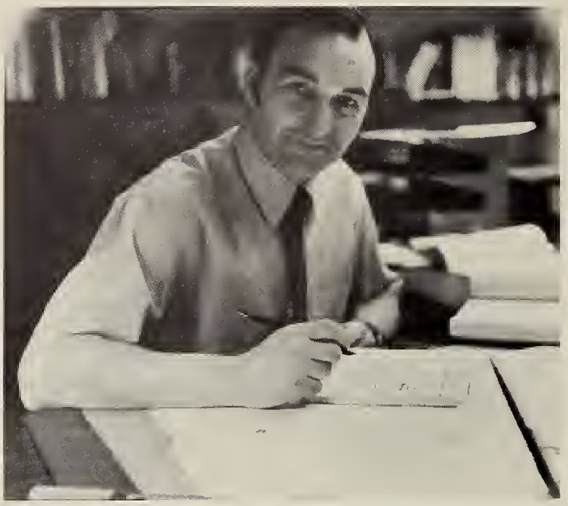
Though sometimes unorthodox, "Trev" is remembered by his students as a dedicated and successful disseminator of practical knowledge. He always had an example from his personal experience to illustrate a point during lectures or labs.

In addition to his devotion to hard rock exploration, "Trev" became very interested in the Pleistocene of Thunder Bay District. He made a detailed study of the results of local glaciation and at the time of his death was completing the first draft of a thesis on the subject requirement for a Master of Science degree.

The dedication of the year book to the memory of T. W. Page, B.Sc., P.Eng. is laudable. The Department of Geology has developed from single instructor status to a major department within the Faculty of Science. It is appropriate that the contribution made by that single instructor should be remembered and recorded.

M. W. Bartley, P.Eng.

Dean's Message



Once more the Geology Club of Lakehead University has demonstrated considerable enterprise in publishing this yearbook. It seems to be a particular talent of our students in the Department of Geology to become thoroughly involved in the corporate interests of the Department and, indeed, of the University as well. Their major contribution to the rescue of the last Carnival Week from the soggy sands of pernicious neglect was one of the best examples of healthy and constructive student involvement in the affairs of this University that has been apparent in the past year.

Currently, the University is examining the implications for its future development that are contained in two public reports of the provincial government's Commission on Post-Secondary Education. One of these is in final form and refers only to the Northwestern Ontario region while the other is concerned in its "draft edition" with all of Ontario. Reactions to both briefs have been mixed and provocative descriptions of their contents commonplace. Certainly as the Universities consume so many of the dollars in the public purse there is no gainsaying the taxpayer's right to expect accountability, but invoices or balance sheets do not quantify the short or long-term value of a university education to the individual, and through him or her perhaps even to the body corporate. In the last analysis there can be no substitute for the goals which are achieved by individual effort and it is within our own compass to rise above misleading and often substandard proposals set by dilettantes or opportunists. Their ideas are passé in any event, unless history lies and the boiling point of water is 5,000^{o}K!

It is a pleasure to commend the students in the Faculty of Science and particularly those in the Department of Geology for their past efforts in their studies and to wish all many happy and successful years ahead in their studies and in their chosen professions. I am pleased to congratulate all of the Geology students who have worked with care and vigour to produce this excellent yearbook.

R. A. Ross,
(Dean, Faculty of Science).

Chairman's Message

The production of this second volume of the Geology Journal encourages me in my belief that the students of our Department are amongst the liveliest in the University. Your co-operative effort expresses an underlying interest in and concern for our community of purpose which is to sustain and enlarge the study and knowledge of the earth sciences.

Everywhere in Canada there is a strong upsurge of enthusiasm for the science of geology and students are coming into the universities in unprecedented numbers. The demand for highly educated and qualified professionals is sure and steady and, even on the most pessimistic of projections, will remain so for many years to come. The demand is not only for geologists in the traditional areas of petroleum and mining geology but is also for people specializing in hydrogeology, oceanography, environmental geology and, a very new phenomenon, in High School teaching of geology. After many years of neglect the profession in Canada is beginning to be recognized as an essential and vital part of our society.

You are learning how to become part of that profession so that you may join a group of Canadians whose work is known and respected by their scientific colleagues all over the world. The responsibility for becoming worthy members of a great profession rests on your shoulders.

Dr. Edward Mercy,
CHAIRMAN,
Geology Department.

with compliments

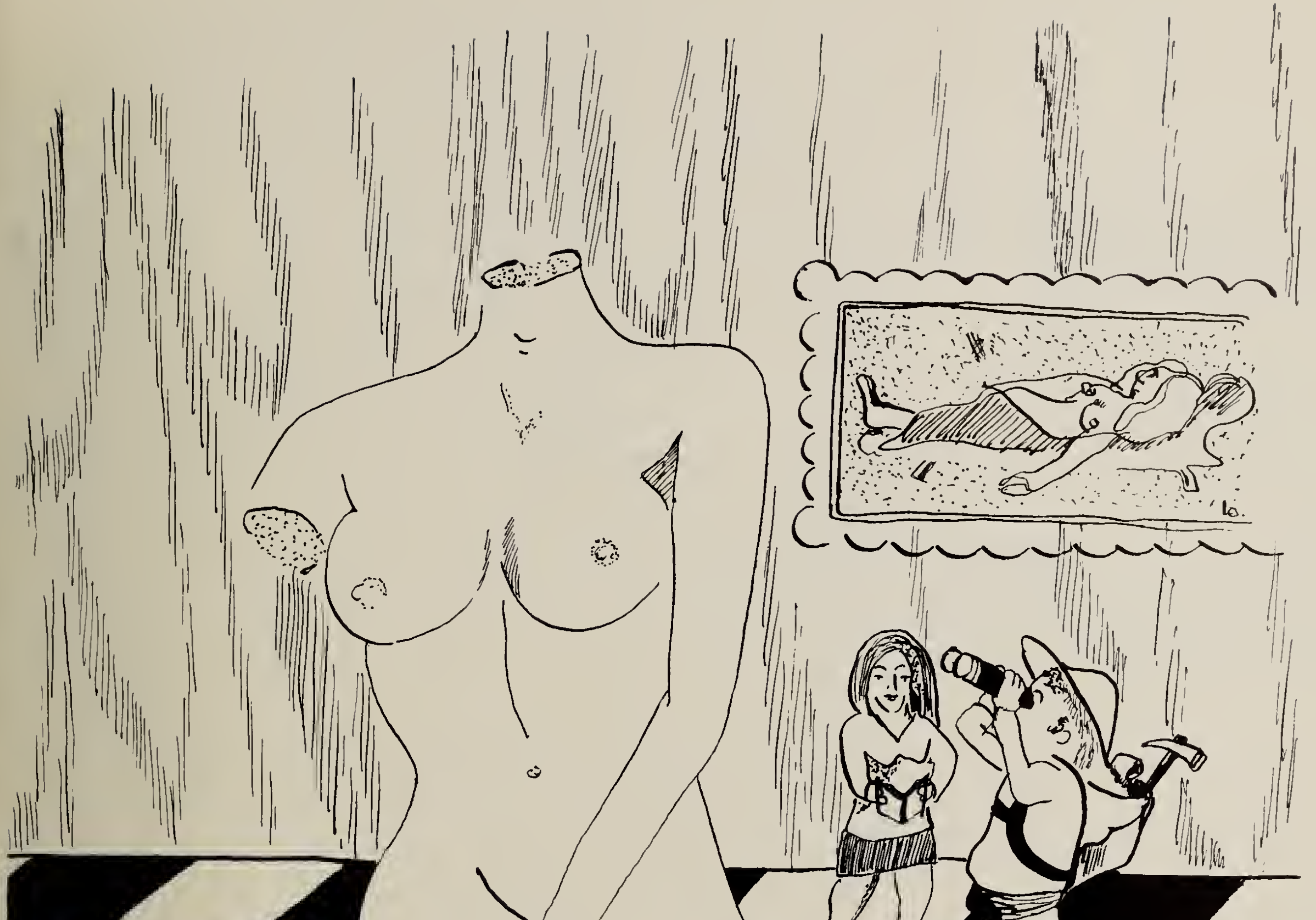
from

the faculty of

science

lakehead university

Dean R.A. Ross



ME, I'M A GEOLOGIST... I STUDY ROCKS.

President's Message

LES TIHOR, President Geology Club

This has been by far the busiest year yet for the Geology Club. But before mentioning its activities I would like to introduce the executive for the past year:

PRESIDENT	-	Les Tihor
SECRETARY	-	Beth Hillary
TREASURER	-	Eric Brown
YEARBOOK EDITOR	-	Dave Powers
SOCIAL DIRECTOR	-	Brenda Cooper

Fortunately the clubs first exploit of the year was no indication of what was to follow. The members decided to supplement our meagre budget by selling hunting maps during moose season. But, due to poor weather conditions and our late start, we sold only six maps worth eleven dollars, and, we were threatened with a fifty dollar fine for erecting signs on a Queen's highway. After this disappointing experience, however, things began working very well indeed.

Morale was very high in the geology department and this was evidenced by the tremendous support shown in club activities. In the Foresters' annual canoe race, for instance, 35 percent of the students enrolled in geology participated (this included one sneaky frogman!). We didn't win anything but it began to become obvious to the student body that there were geologists around.

The club again made its presence known by rescuing the annual Winter Carnival King and Queen contest, previously cancelled due to student apathy. Amazingly, an activity that no one had seemed to want anymore turned out to be a fantastic success. During carnival week we also 'acquired' the Engineer's prize cannon and actioned it off to the highest bidder. This was in retaliation for their kidnapping the geology Princess and holding her for ransom. The $56. proceeds of this friendly conflict went to the CNIB.

Along more academic lines, the club members enjoyed an interesting and informative underground tour of International Nickel's new mine at Shebandowan, Ont. We very sincerely thank INCO and in particular, Mr. J. Vance, Mine Geologist for their time and co-operation, and for a wonderful dinner.

We were fortunate also to have a number of fine speakers from various parts of Canada and the U.S.A. A part of this book is dedicated to these speakers and their topics.

Finally, in addition to a number of parties throughout the year, the Geology Club sponsored L.U.'s Wind-Up Dance of the year. The profits from this dance provided the last crucial part of the revenue needed to guarantee publication of this book.

All in all, it was a fine year for the Geology Club and I would like to thank all those who made it so. A special hand goes to our Year Book Editor, Dave Powers, and his staff who have put in a great many hours to make this second Yearbook a standard to be aimed at in the future years.

Les Tihor.

Editor's Report

Following in the footsteps of last year's "Year Book" success we began the groundwork for the new edition in early Fall. Our primary purpose for the year book is to make our presence known. And what better way to accomplish this than to advertise our Department!

I should like to take this time to thank each Professor and all the members of the Geology Department for contributing to the success of our second Year Book. A special thanks is extended to Mrs. Jean Helliwell, the Geology Secretary, whose typing skills and business experience proved to be invaluable; and to Mr. Sam Spivak, the Geology draftsman, with his drafting and artistic talent in giving us a hand by drafting the crests and advertisements.

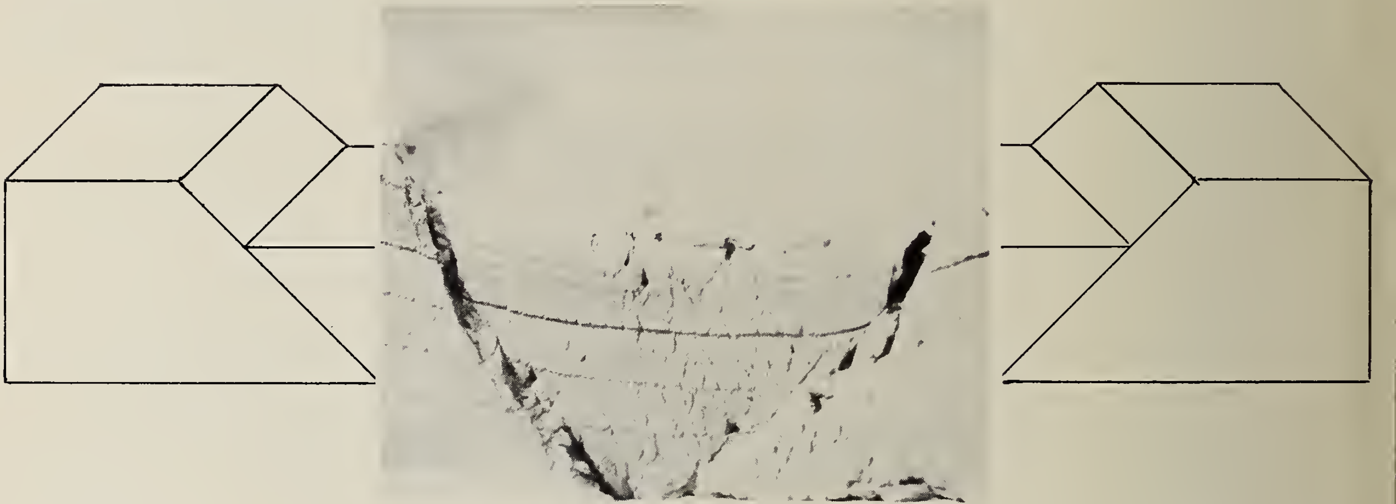
The experience of working with this year's staff has been an enjoyable one, and an experience I hope next year's second year class will take up and enjoy.

Thanks to my staff for their patience and time:

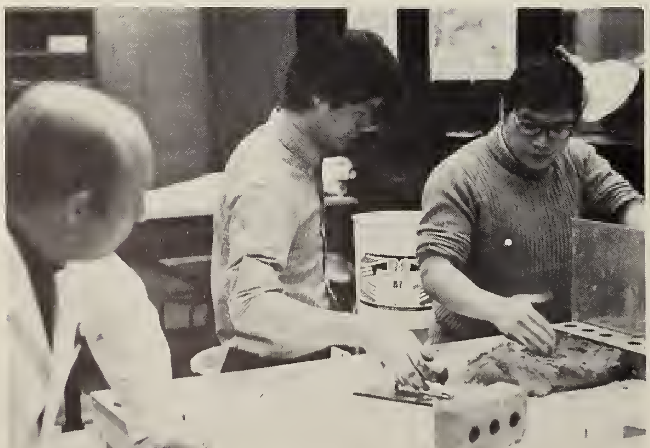
Ron Wrigley	-	*Co-editor*
Rob Larsen	-	*Advertising Manager*
Les Tihor Bob Scott Ron Green Brian Tittley	-	*Photographers*
Gary Grabowski	-	*Layout Manager*
Eric Brown Beth Hillary Barry Pinn	-	*Layout*

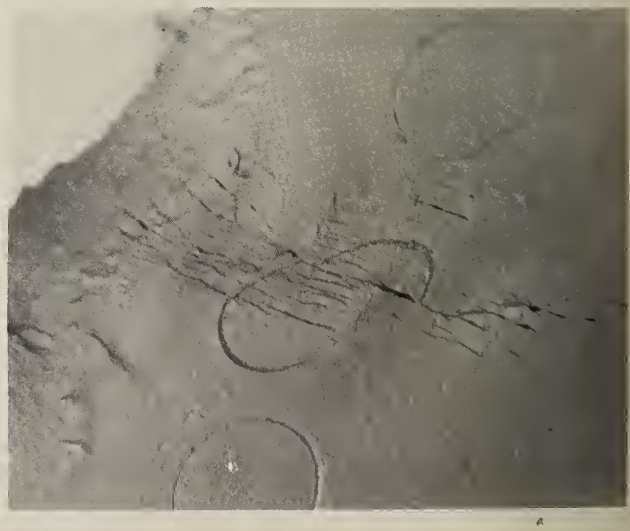
Dave Powers,
Editor.

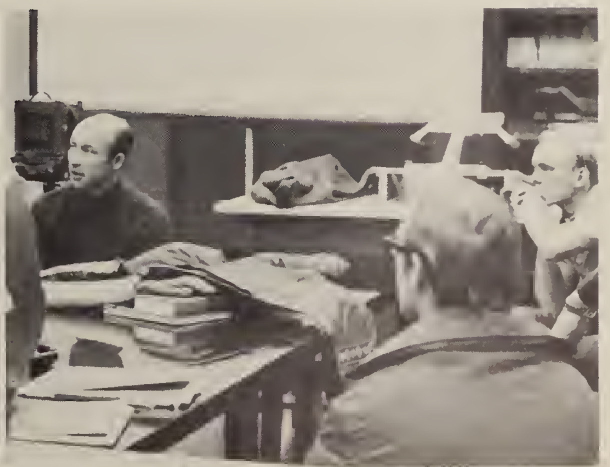
Kakabeka



Clay ?





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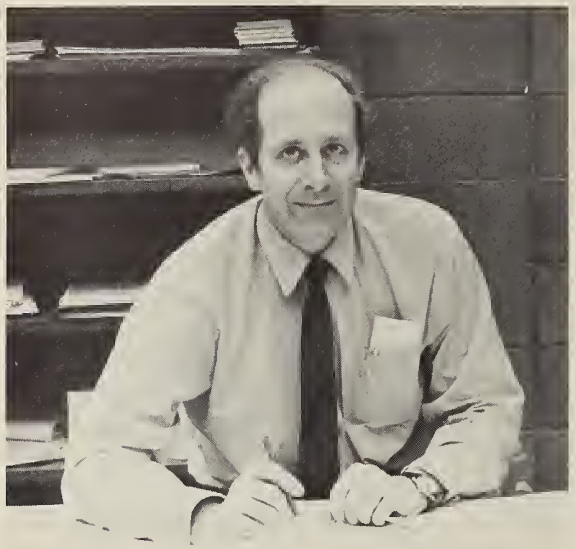


Dr. John S. Mothersill, B.Sc. (Physics) (Carleton Univ.); B.Sc. (Geological Engineering) (Queen's University); Ph.D. (Geology) (Queen's University).

Background

Geologist - Standard Oil Company of New Jersey

Senior Geologist- Mobil International Oil Company, Basin analysis in Nigeria, Colombia and Southern Africa

Associate Professor - Lakehead University

Reader - University of Nigeria, Nsukka, Nigeria *(Sabbatical leave 1972/73)*

Research

1) Limnological studies of Lake Superior.
2) Mesozoic stratigraphy of Western Canada.
3) Limnological studies of Lakes Chad, Albert and the Niger Delta.

Limnological studies of the Canadian portion of Lake Superior were carried out for the third field season under contract to the Canada Centre for Inland Waters, Burlington, Ont. To date nearly two-thirds of the Canadian portion of Lake Superior has been covered by a regional survey grid. During the 1971 field season the studies provided employment opportunities for the following students for at least part of the summer: Patrick Fung, George Einarson, Allan Speed, Beth Hillary, Peter Friske, Bob Kyryluk, Keith Heckley, Eric Brown and Dave Powers.

A survey of the lake-proper was carried out from the Martin Karlsen between Pigeon River and Marathon along north-south lines every five minutes of longitude (approximately four miles). Benthos cores and Shipek grab samples of the lake-bottom sediments were taken at 325 stations and an echo sounding survey was carried out between sampling stations. In addition 110 stations were sampled in Nipigon Bay along a grid, two minutes of longitude by one minute of latitude (approximately 1.0 miles by 1.5 miles), from a Boston Whaler using a Ponar grab sampler and Phleger corer.

The following information has been compiled into map form to show the distribution of:

1) the Eh and pH measurements of the lake-bottom waters and sediments;
2) the first map of the lake-bottom topography in nearly 50 years;
3) the grain size and mineralogical distribution of the lake-bottom sediments;
4) the amounts of organic carbon, total carbon, iron, manganese, nickel, copper, zinc, chromium, strontium and mercury in the lake-bottom sediments.
5) the Quaternary stratigraphy.

The regional limnological studies of the Canadian portion of Lake Superior will probably be completed during the 1973 field season.

DR. HENRI LOUBAT, Geological Engineer, Ph.D. Geneva; Assistant Professor, Lakehead University

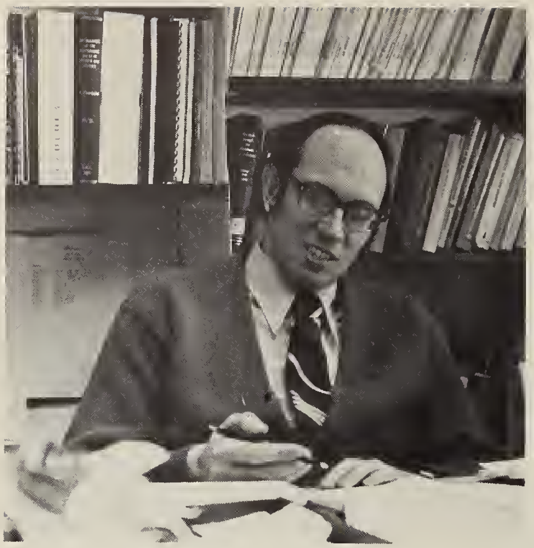
Bold astonomers occasionally suggest a variation of physical parameters such as the gravitation "constant", since the birth of the solar system. But we don't have to go so far in the hypotheses to reasonably assume that if we are going back 3.10^9 years, the earth's aspect has been somewhat different from what it was in recent geological times, during the last 600 m.y. for instance.

In these very old Archean times, the size, shape, thickness of crustal (continental?) plates, the depth and nature of the oceans, the atmosphere, the climates were probably different from what they are now. Although some volcanic and sedimentary features seem similar to recent phenomena, we can reasonably guess other rates of volcanism and sedimentation, other relationships between crust and mantle in these remote times. If now we focus our interest on metamorphism, we could expect that the pattern of regional metamorphism has to be different in Archean and recent orogenies. It is easy to understand that the metamorphism of rocks is not only due to the absolute pressure and temperature, but also (and mainly) to the rate of the physical actions, to the trends of those "stresses": if for example the mass of crustal plates was much smaller than the mass of the recent continental plates, if the heat flow (beside volatile activities, H_2O, CO_2..) and if the rate of sedimentation were also different, the pattern and the definition of metamorphic facies would be different from the classic schemes that we know from the works of Barrow, Turner, Winkler and others, working on much less ancient orogenies.

For instance, if the absence of glaucophane-schist facies is confirmed in Archean belts, this could eventually indicate that narrow belts of extreme pressure and weak increase of temperature were missing in these times, indicative of smaller, lighter colliding crustal masses.

It seems promising to initiate a systematic study along these trends. At the onset, with a limited team, the best thing to do would be to investigate several limited areas in "greenstone belts" and to clarify what I call the "style" of metamorphism. We shall have, of course, to discriminate what is to be attributed to the many thermal aureoles around magmatic intrusions, also to discriminate the diaphthoresis from an initial 'positive' metamorphism.

Among many other fields, this one could confirm Thunder Bay as a major location for geological studies and research.



DR. JAMES M. FRANKLIN, B.Sc. (Carleton); M.Sc. (Carleton); Ph.D. (Western)

Assistant Professor.

MID-WEST SUPERIOR GEOTRAVERSE RESEARCH GROUP

During the first half of this century, many of the world's prominent geologists maintained that Precambrian Shields are composed predominantly of granite and contorted metamorphic gneiss. The apparent complexity of the geology was exemplified in those areas immediately adjacent to the relatively simple Phanerozoic rocks of the United States. Unfortunately, Precambrian rocks of New York and immediately north of the eastern States belong to the Grenville Province, and area affected by at least three orogenic periods. The Grenville Province is understandably structurally and petrologically complex. Had these geologists ventured north to Noranda, Timmins or Northwestern Ontario, they would have quickly realized that some portions of the Shield are less structurally complex than the Appalachians, and that distinct time and lithostratigraphic subdivision of the shield is possible.

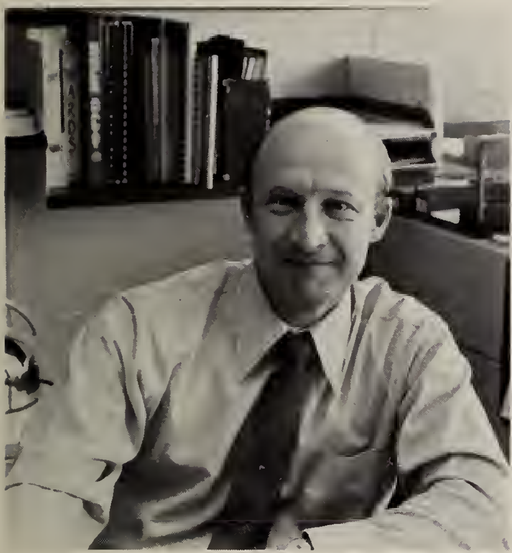
In the past 20 years, application of standard stratigraphic, structural, and petrographic techniques has resulted in unlocking the apparent secrets of the Precambrian. We now realize that that the oldest (Archean) areas of the shield are composed of three major elements, the economically important "greenstone" or volcanic belts, the metamorphosed and high deformed sedimentary or "gneiss" belts, and an assortment of granitic and mafic intrusive rocks. The first two "stratified" elements show remarkable stratigraphic continuity. Perplexing problems remain however. What type of "volcano" and volcanic structure was present during Archean time? Are the greenstone belts precursors to our present day "island arc" belts? On what type of crust were these volcanos built and what representatives of the ancient primeval crust do we see today? What mechanism has deformed the belts relatively intensively, yet metamorphosed them so little? What is the origin of the sedimentary detritus, and why are the sedimentary deposits highly metamorphosed and deformed, relative to the volanic areas? How old are the Archean rocks, and what tectonic stages are represented by these sequences?

These and many other interesting problems have gained the attention of many geologists, but limited access, incomplete mapping, and the necessity of employing a divergence of specialists in order to attack a problem, have prevented geologists from finding the answers. A group of 12 geologists have thus joined together as a result of a necessity of using "team approach" to solving Archean mysteries, to form the Mid-west Superior Geotraverse Research Group.

The research group is directed by Dr. A. M. Goodwin of the University of Toronto and includes Dr. Currie (U ot T), Dr. Schwerdtner (U of T), and Dr. Kehlenbeck (Lakehead) as a structural geology team, Drs. Fawcett and Goodwin (U of T) and Dr. Loubat (Lakehead) as petrologists, Drs. West, Halls, Farquhar and York (U of T - Geophysics) as geophysicists and geochronologists, Dr. Mercy as geochemist, Dr. Naldrett (U of T) and myself as economic geologists. Dr. L. Ayres of the Ontario Department of Mines and Dr. J. O. Wheeler of the Geological Survey of Canada are acting as Government liaison personnel. The group has taken as its area of study a broad "corridor" extending north from Shebandowan to Pickle Lake. The corridor encompasses at least three volcanic belts and two sedimentary gneiss belts. It contains virtually an entire suite of Precambrian lithotypes and is probably completely representative of Canadian Shield Archean geology. The corridor is traversed by several roads and railroads, and further access may be gained by the abundant lakes and rivers of the area.

Several participants have initiated studies: Currie is studying structure and paleomagnetism near Lac des Mille Lacs. Farquhar and York are applying the new Ar39/Ar40 techniques to dating metamorphosed rocks. Halls is examining the application of paleomagnetic techniques to Archean rocks. Goodwin has initiated petrochemical studies in the English River gneiss belt. I have undertaken a study of the base metal deposits in the Sturgeon Lake area. This summer Dr. Loubat will begin studies of metamorphic isogrades in volcanic rocks, Dr. Kehlenbeck will study the structural domains associated with sedimentary-intrusive sequences north of Thunder Bay.

The Geotraverse studies will probably continue for a period of ten years. The ultimate objective is to test several hypothetical "models" of Archean geology in order to find a more suitable explanation for the observed features.



Dr. Manfred M. Kehlenbeck, B.A. (Hofstra University); M.S. (Syracuse University); Ph.D. (Queen's Univ.)

Background

Research Associate for Adirondack Project Consulting Geologist (Ground Water)

Geologist for Quebec Department of Natural Resources

Visiting Professor at University of New Brunswick

Assistant Professor, Lakehead University

Research

Petrography and metamorphism of rocks in the Little Moose Mountain syncline, Adirondack Mountains, New York. Deformation textures in plutonic rocks, specifically anorthosites.

My initiation into the geological problems of Precambrian terrains was in 1960 while attending Syracuse University. There, I was fortunate to participate in a research project which was then just starting. Our investigation focused on the south-central portion on the Adirondack Mountains of New York. Simultaneously other universities were working on their research projects, so that the entire Adirondacks were receiving renewed scrutiny from many disciplines of geology.

Of particular interest to me was the metamorphic petrology and structure of the Grenville metasedimentary sequences. Among the results of the field work was the establishment of four subfacies within the granulite facies as well as a distinction between basement and supracrustal rocks as defined by lithologic character, structure, and total rock textures.

In 1965 I left the Adirondacks, moved north across the Frontenac axis, and entered into the Grenville Province proper. During the next four years I became acquainted with the geologic complexities of southeastern Ontario and Quebec.

My association with the Grenville Project provided me with an invaluable learning experience. This project undertaken by the Quebec Department of Natural Resources involves 4-mile reconnaissance mapping of areas bounded by two degrees longitude and two degrees latitude (approximately 10,000 square miles) per field season. The value of such field work lies in the vast amount of geological information which is gathered in a single summer.

To facilitate the analysis of the voluminous data, computer techniques were developed. This enabled standardization of data input, providing consistency in the recorded observations of all participating geologists. Computer treatment of the geological data greatly increased the time available for interpretation and extended the manipulations to which the data could be subjected.

After nearly ten years of field experience with highly deformed and metamorphosed Precambrian rocks, my interests have become more and more centered on the structural evolution of Precambrian shield areas. Reconstructions of evolutionary paths rely heavily upon recognition of structural domains and on an understanding of their place in the tectonic framework. This is especially important if the absence of distinctive lithologies or structural trends prevents clear delineation of major structures.

An example is the Lac Rouvray anorthosite massif in Quebec. Investigating textures produced by cataclasis and recrystallization has shown that this igneous intrusion displays a spectrum of whole-rock textures ranging from primary igneous to completely metamorphic. Hence the amount of deformation, in this case primarily recrystallization and cataclasis, is variable from place to place and defines distinctive structural domains. These deformation textures demonstrate that this course-grained igneous rock was in places completely reworked to a metamorphic gneiss bearing little resemblance to its ancestor, (Plate 1). The petrologic implications of this could be far reaching when considering the origin of the vast monotonous "seas" of quartzofeldspathic gneisses so abundant in shield areas.

Since my arrival at Lakehead University last September I had had limited opportunity to study the local geology; however, I hope to remedy this as soon as the snow melts.

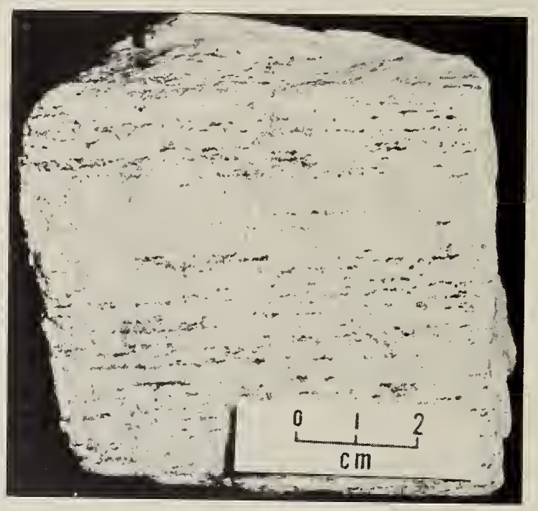


Plate 1

Plagioclase-biotite gneiss derived from anorthosite by complete recrystallization.

Dr. M. W. Bartley,
Special Lecturer.

A GEOLOGIST

I was invited to contribute a personal experience to this edition of the Year Book. What better example than becoming a geologist. It is unlikely that my experience is greatly different from the majority of other graduates in geology.

During my secondary school tenure I was exposed to the usual humanities and sciences but do not recall any reference to the solid earth science. On entering University in 1930, I elected Science as a broad area of study. The curriculum required enrollment in four sciences, english, a foreign language, and a non-science elective. Not being biology oriented, I selected the unknown, geology, to complement chemistry, physics and mathematics. The subject proved so interesting due primarily to the enthusiasm of the professors and the senior students that I was more than delighted with my selection. After four years of intensive instruction in the basic phases of the discipline plus two summer seasons prospecting, I graduated. Now I am a geologist - so I thought.

My application for summer employment with the Ontario Department of Mines as a field assistant was accepted and I was assigned to a survey party as a junior assistant. I was certain that at the close of the field season I would be forced to choose from a variety of responsible positions offered by government and industry. After all, I was a *GEOLOGIST*. No offers came. After three months of waiting, I partially realized my naivity and went searching for a position.

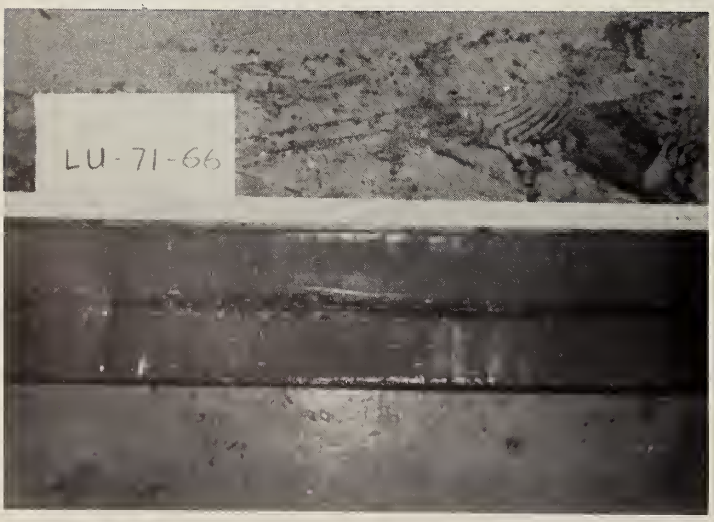
The Provincial and Federal Departments were well staffed with men holding post-graduate degrees and/or several years' experience. They would require junior assistants next field season. My enquiries to exploration and mining companies envinced similar replies, but some did have jobs (not positions) open as survey helpers and draughtsmen, underground samplers, mill and mine helpers, and university graduates would be favourably considered. Not for me, I was a *GEOLOGIST*.

During my search for a position suitable to a B.Sc. in geology, I fortunately encountered a senior consulting geologist who offered sage advice and thereby brought me back to reality. He reminded me that I was only a graduate in geology, not a geologist. He convinced me that I might become a geologist in five or ten years depending on how hard I worked at gaining experience and increasing my knowledge. This came as quite a shock. He pointed out that although I had been provided with a sound geological academic training, this was only the beginning. I must now augment this training with practical experience and if possible attain post-graduate degrees concurrently. In reply to my query as to how this might be achieved since there was no positions commensurate to my academic accomplishments available, he delivered a never-to-be-forgotton lecture. The gist of the lecture was for me to descent from my lofty pedestal, realize that my degree was only a tool, and seek a job in the industry which would further my general education. He went on to explain that a geologist must have an appreciation and general knowledge of the associated arts of exploration, mining, mineral dressing, and evaluation. The logical methods of acquiring this knowledge were to work as an assistant or helper in any category on an exploration project, in an operating mine, and in a mine engineering office. Above all, to observe the work of others in many different operations and endeavour to learn all I could about the other man's job in order that I could have a fuller concept of solid earth science.

I followed his advice and worked progressively as a core grabber and logger on diamond drills, as a surveyor's helper on surface and underground, as an underground sampler and assayer, and as a mine planning assistant as well as geological mapping during and after my post-graduate studies.

Some seven years after graduating with a Bachelor of Science in Geology, I felt that I had sufficient experience and knowledge to be a *GEOLOGIST*.

M. W. BARTLEY.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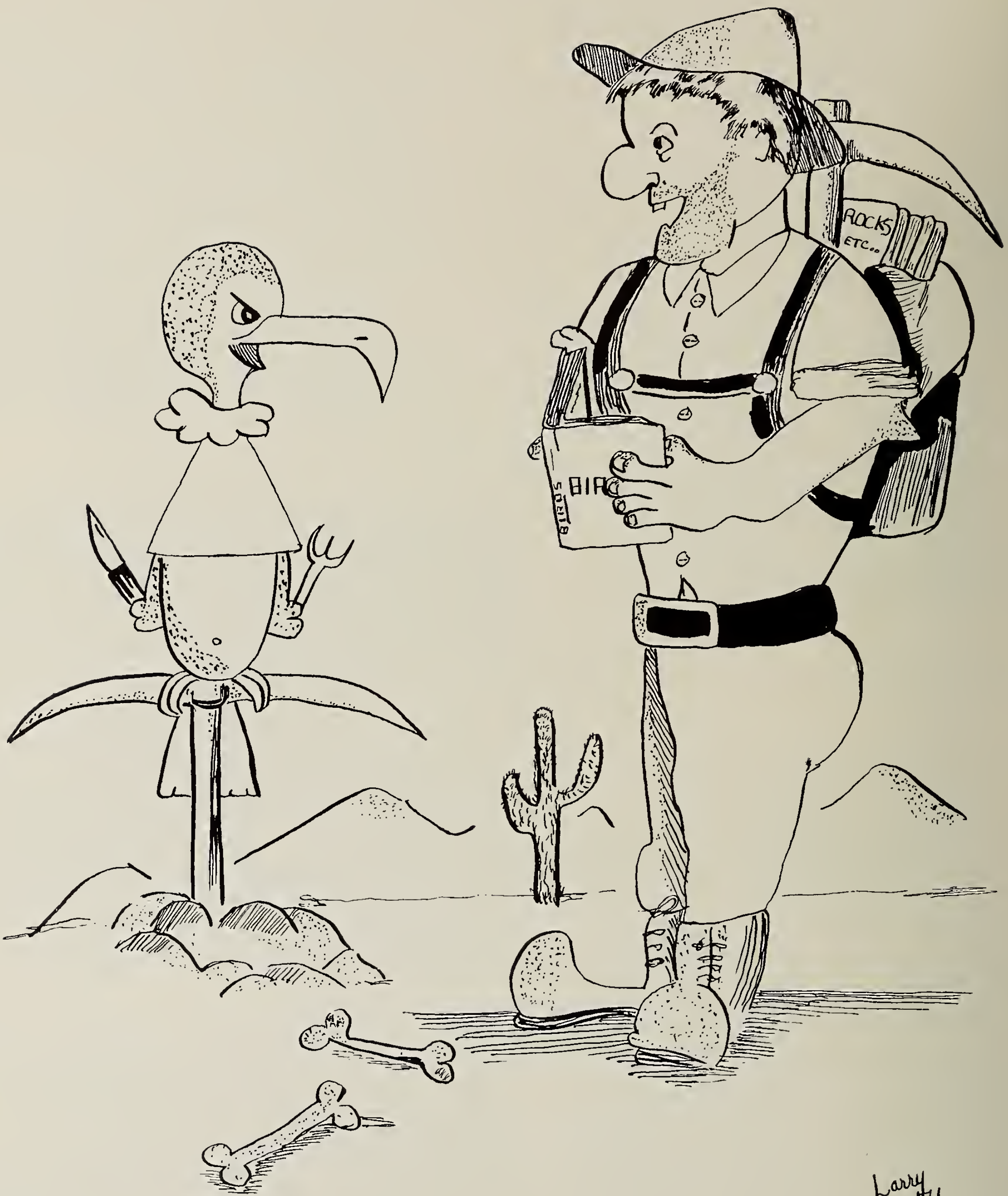


SO, IF YOUR NOT A ROBIN...

Geology Secretary

Mrs Jean Helliwell

MR. R. L. BENNETT, *Principal Technician.*

'The Ancient Craft of Lapidary'

Lapis - a stone.

Lapidary - a person engaged in gem stone fashioning for adornment.

In fact Stone Age men were the first lapidaries in as much as they gathered bright coloured pebbles and rubbed them with sand and other rock to wear down the rough surfaces and in doing so produced a semi-polish in turn improving the colour of the stone.

As time passed between the ancients and the old Chinese and Egyptian civilizations, various methods were improved, i.e. the wheel was invented and the ability to mount a piece of bamboo as a type of lathe, the invention of bronze and iron and along with these marvels the endless trial and error of various sands and minerals as abrasives.

The ancient Chinese lapidary started to work rock crystal with quartz sand. This was a very slow arduous task. Then some craftsmen started using red sand (garnet) and found that this cut faster and did not break down so readily also that the fine powders gave a good polish. In fact garnet was used for centuries by the Chinese jade workers.

As for the ancient Egyptians, I am sure they used similar abrasives because of the outstanding finish on some of the lapis-lazuli ornaments found in the tombs, not forgetting the gorgeous floor tiles of semi-precious minerals. I am, however, more familiar with the Chinese workmanship.

There is a story told of a caravan arriving at a well known Chinese lapidary centre with bits of a brown mineral which was said to scratch even the hardest stone. Some of this was eventually broken and ground down in the garnet mill (a stone wheel turned by a mule, similar to an old corn mill). It was then found that this new brown minerals was indeed harder and at once became much sought after. It was, in fact Corundum - no doubt weathered out from a Pegmatite and just lying around.

Now to the tools used.

To cut the larger pieces of jade, rock crystal, turquoise, etc. the bown string type of saw was used, the string being replaced by a strip or rough wire of bronze. The general method was to sit two of the younger sons of the head craftsman one on either side of the piece to be cut, charge the wire with abrasive and get going with push and pull. Many moons later it was cut through, these were the days of "Wat no clock". If a slab was required, the work simply started again. All abrasive, no matter how fine, was re-cycled and used again and again. I mentioned bamboo tubes. These were extensively used in the making of beads; the method is very simple and is used to the present day with modern materials. As the bamboo is hard when dry and has a tubular structure down its length, it makes an ideal material to hold abrasive. The material is roughly formed by rolling and grinding, then it is held against one end of the tube. The tube is filled with wadding or leather and abrasive applied. The tube was then turned, not in full revolutions but half turns by means of a simple pedal. The stone was soon ground to a smooth ball. I have done this myself and it works very well. The finished ball is now drilled to make a bead using a bow drill and a bronze wire bit.

Over the years lapidary tools improved and gems were better cut and polished but I do not have space here to enlarge on this aspect. However, I will describe the workshop where I watched and old craftsman work and where as a very special favour I was allowed to try the hand operated equipment. It was situated in the main room of St. James Square, Edinburgh, originally occupied

by some member of the aristocracy. It contained what appeared to be an Adam fireplace, the windows were begrimed and the floor was like a small quarry with bags of rough stones lying about. Mr. Begbie, the lapidary had worked there as a boy with his grand-uncle Mr. Cameron who was himself a lapidary and seal engraver and when Mr. Cameron died, Mr. Begbie carried on the business. Mr. Begbie was 83 years old when he died some six years ago. His workshop has returned to dust as the whole square has now been demolished.

The workroom was still equipped with the old hand driven lap, or to be more precise - hand driven skive which is a vertical shaft with a square boss in the centre to fit the square hole in the turntable (or lap) made of lead and the whole assembly turning between centres belt driven by hand operated shaft running parallel to it.

As it is very difficult to cut a gemstone whilst holding it in the bare fingers, a painful procedure anyway, a very simple holder is used. This is called a 'dop stick' and is usually made from a hard wooden rod, similar to old knitting needles, the diameter of the rod approximating the size of the gem to be fashioned. The rod is about 6" x 8" long and tapered at one end. To the other end is fixed a blob of wax, bees wax and resin in the old days, more recently yellow leaf shellac. This 'blob' is warmed over a spirit flame and the rough stone is likewise treated and then bedded securely into the wax, leaving free the first surface to be ground and polished. When this side has been completed, the wax is warmed once again, the stone removed and turned to the next surface and so on until the work is completed.

In order to grind a regular pattern of facets a 'Jab peg' is used. This is a piece of wood shaped like a small inverted gourd, 4½" high, 2½" in diameter, tapering to 2" at the bottom, a hole is drilled down through the centre so that it will fit on a vertical post at the side of the lap. The surface of the "Jab peg" has an arrangement of shallow holes spiralling from the top to the bottom (see illustration). The vertical post mentioned above is situated about 2" from the edge of the lap and the "Jab peg" is secured to this by means of a long tapered wedge. Adjustment is obtained by raising or lowering the "Jab peg" on the post and driving in the wedge. The angle of the facet to be cut is obtained by placing the tapered end of the 'dop stick' into the holes on the "Jab peg" and raising or lowering the "Jab peg".

The abrasive used by Mr. Begbie was 'Emery' - a form of corundum with magnetite or hematite - or what might be termed 'Bort' corundum. This powder is commercially ground and sold in 1 lb. bags. Each grade or grit of abrasive is stored in separate stone jars - similar to the old type preserve jars - and each has a separate brush used to brush the abrasive on to the lap. This lap is made of lead. Lead you may ask is a strange metal to use for a lap because it is soft as compared with other metals, but lead hardens with use and becomes impregnated with the sharp abrasive. This surface is very helpful when working small fine facets. The final polish of the gem is done on a block "Tin lap" using "rotten stone" as the polishing agent.

Although this machine is hand-driven it is very accurate and relatively quiet and restful. The results obtained are very satisfying. However -

Patience is a virtue,
Possess it, if you can,
It's never in a woman,
And seldom found in man,
and
If at first you don't succeed,
Try, try, try again.

The "Song of the Lapidary"!

SAMUEL T. SPIVAK
Drafting Technician

The Department of Geology has a fairly extensive map library comprising of approximately 3400 geological maps, including excellent coverage of Ontario and good coverage of the rest of Canada (Ontario Department of Mines; Geological Survey of Canada and Provincial mapping agencies), as well as partial map coverage of the remaining countries (full coverage of Australia), and the moon.

All Canadian maps are catalogued according to publishers' series and cross indexed with the National Topographic System. Maps exclusive of Canada are catalogued according to the Library of Congress classification and these methods enable anyone to go to our map library and immediately pick out any map of a given area. Geological maps are also catalogued according to approximately 96 different geological, geophysical, geomorphological, structural, physical, stratigraphic, economic features so that if one wishes to, in a lecture, emphasize a specific geological aspect such as faulting, folding, glacial features, etc., he is able to immediately pick out a map that best illustrates this. All the above information is stored on computer tapes and a print out of all catalogues is readily obtained.

Drafting time is largely devoted to preparing drawings, overlays and maps for use by the geology professors as teaching aids as well as catering to individual drafting needs which include such projects as "Limnological Studies of Lake Superior" by Dr. J. S. Mothersill and (this year) a detailed field guide book to be used in conjunction with the 24th International Geological Congress conference in August of 1972 (this section being organized by Dr. J. M. Franklin).

Throughout the year a considerable amount of drafting time is utilized by other departments in the Faculty of Science for the preparation of graphs, charts, sketches to be used in published papers.

Two particular interests of this drafting department include: i) a project to prepare a geological relief model of the area from Marathon west to Atikokan and as far north as Armstrong. I'm sure that this would give a better impression as to the relationship between geology and topography in this particular area; ii) a more extensive and uniform rock-type legend system that would allow a maximum flexibility by all geologists and cartographers.

S. T. Spivak

PAT ZURKAN, *Laboratory Technician*

For the past five years I have been employed by Dr. J. S. Mothersill in carrying out the research studies of Lake Superior supported by the National Research Council of Canada and the Canada Centre for Inland Waters.

During the summer months I am required to prepare field equipment for student assistants carrying out research studies along the lake shore and also prepare supplies and equipment used for the major research vessel operations on Lake Superior.

On the research vessel I am required to take a portion of the grab sample for benthic fauna samples. The sample was thoroughly washed to remove the clay and silt fraction. The remaining sample was treated with magnesium sulphate in order to separate the fauna from the remaining debris. The fauna present in each sample were then placed in an alchohol-filled vial for preservation until identification could be made.

After the compilation of data from the lake the samples were brought back to the lab for extensive study.

Representative cuts of approximately 100 grams weight were made from each of the sand samples using the quartering-by-hand method. The grain-size distribution of the sand fraction was determined at 0.25 phi(ϕ) intervals using sieving methods, and the grain-size distribution of the remaining silt and clay fraction was determined at 1.00 phi(ϕ) intervals of pipette methods. Cuts of the silt and clay samples were made from the core for grain-size distribution which was determined at 1.00 phi(ϕ) intervals by sieving and pipette methods. After the grain-size analysis of these samples were calculated, the figures were transferred on IBM sheets in order to determine the skewness, kurtosis, standard deviation and mean size by computer.

Heavy mineral separations were carried out on representative sand samples using tetrabromoethane(S.G.=2.94). The heavy minerals were then separated into magnetic susceptibility suites using a hand magnet and a Franz magnetic separator at settings of 0.35, 0.80, 1.20 amps., and the non-magnetics at 1.20 amps.

From cuts of the silt and clay samples from the cores I prepare samples for x-ray diffractometry analysis along the sample preparation for atomic absorption analysis.

After all the lab work has been completed, the data compiled and the results calculated, I am required to type up all Dr. Mothersill's papers and reports, core description sheets, etc.

Pat Zurkan

ANN SUMPTER
Technician

There are sixty comprehensive sets of the more important minerals, rocks and fossils from which the first year Geology student learns the basic rules and exceptions of identification and classification of geological specimens.

These minerals, rocks and fossils are catalogued into their specific groupings in such a way as to follow exactly the general geology laboratory manual which was composed by Dr. J. Mothersill of Lakehead University's Geology Department.

With the aid of the manual and the specimens the first year student receives a good basis for further geological studies. Many of the specimens can be found locally as the students discover when taken on field trips, and as a result, the student can associate specimens found in the field with the specimens supplied in the laboratory by performing the same simple tests for identification, e.g. hardness, cleavage, etc., as they use for identificating specimens in the laboratory.

From the fossils the student learns how the age of sedimentary rocks are determined.

Following this the student learns basic structural geology such as stratification, layering and foliation; then geomorphology which is the study of the changes in the landscape due to erosion; culminating in the study of geological maps that show patterns of rock type outcrops, stratas, faults and folds in fact all the information the student has learned in his or her first year geology.

MR. RICHARD L. STEPHENS

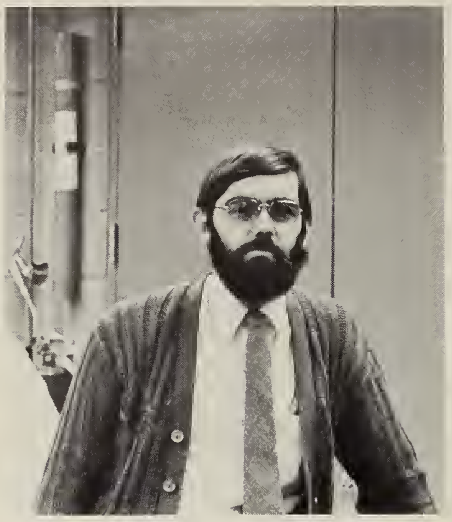
Seismic Technician

The Seismic Station at Lakehead University began operation in March 1969 and is one in a network of 28 stations in daily operation across Canada. This seismic network has been established in such a manner that no point in the country is more than 300 miles from a seismic station.

Recordings produced by these stations make possible the detection and location of all major earthquakes, underground blasts, and nuclear explosions anywhere in the world. Seismic records are produced by a photographic process and must be changed and developed every 24 hours, along with the calibration of recording and detection equipment. Daily records are then annotated, analyzed and forwarded to the Seismology Division of the Earth Physics Branch, EMR, Ottawa. All major disturbances recorded by stations are immediately telexed to Ottawa to permit rapid determination of precise locations of events.

Seismic studies are based on measurements of the time at which a particular disturbance was recorded, and the amount of ground motion it produced. Seismologists are currently using seismic records for such research projects as the determination of seismic risk zones in Canada; the related problems of practical standards for earthquake-resistant construction; and investigations of the regional properties of the earth's crust, mantle, and deep interior.

R. L. Stephens



MR. DON MURRAY
Geochemistry Laboratory Technician

The geology research lab is located in Room CB 0021 with an auxilliary crushing lab in Room CB 0004.

The lab is equipped to handle most types of geochemical analyses. In addition to the chemicals, glass and platinum ware, balances and furnaces necessary for classical gravimetric analyses, the lab also has a Bausch and Lomb Precision Colourimeter and a Perkin-Elmer Model 303 Atomic Absorption Spectrophotometer. The latter two instruments offer a rapid, precise method for major and trace element analyses.

Most first, second and third year geology majors will not have come in contact with the lab as it is used only for research purposes by faculty and fourth year students. This year Pat Fung and Allan Chan have made extensive use of the lab while doing research for their thesis-seminar course. It is part of my responsibility to offer guidance and assistance to students using the lab for these projects.

In addition to helping Pat and Allan I have done analyses for H_2O+ and H_2O- on rock samples for Dr. E. Mercy and trace element analysis by Atomic Absorption for Cu, Ni, Cr, Sr, Mn, Zn and Fe on sediment samples for Dr. J. Mothersill.

My congratulations to the Geology Club for having a very active and successful year.

Don Murray,
Hon. B.Sc.(Chem.).

WINTER

CARNIVAL

Whose

Cannon?


ENGINEERS DO
SERVE A
PURPOSE
ENG
Larry '11

ALLAN CHAN, *Fourth Year Honors*

ELEMENT DISSEMINATION IN VOLCANIC ROCKS

Due to the variation in mineralogical composition a suite of volcanic rocks should have a variation in densities. This variation may be a good indicator of the different rock types. Titanium, Potassium, Copper, Zinc and Nickel are commonly found in rocks and may give a basic indication of rock types. With this in mind the purpose of my thesis was:

1) To find a simple analytical method of determining rock types, especially distinguishing rhyolite from rhyodacite, and andesite from basalt;

2) To see if the trace elements reflected a variation similar to the major elements and; 3) To see if there is any significant trace element difference existing between the suite of volcanic rocks from Sturgeon Lake, a base metal area, and Wawa, an area barren of base metals, which might indicate the presence of a massive sulphide deposit.

In order to accomplish this the concentrations of K, Ti, Ni, Zn and Cu in sixty samples were determined by using atomic absorption techniques.

Through experimentation it was found that the specific gravity method of classifying volcanic rocks fails to give satisfactory results, but perhaps this is due to experimental error.

It is apparent that Zn is best correlated to TiO_2 and K_2O and gives the best range of values in the classification of volcanic rocks. Cu is correlated better in TiO_2/K_2O only. And Ni is more or less not correlated in K_2O or TiO_2.

Allan Chan

PATRICK FUNG - *Fourth Year Honors*

THE DISTRIBUTION OF IRON, MANGANESE AND TRACE ELEMENTS IN THE WATER-SEDIMENT INTERFACE OF CENTRAL NIPIGON BAY, LAKE SUPERIOR

The main topographic features of central Nipigon Bay consist of a narrow, steep-sided channel; a shelf-area of variable width, being much wider along the north shore than along the south shore and a shelf-break which is predominant in the northern part and almost absent in the southern part of the topographic channel.

The Eh and pH values on the water-sediment interface samples indicate a slightly oxidizing and weakly alkaline environment.

There are three types of sediments found on the lake-bottom: (1) a thin layer of sand occurring mainly along the shores, (2) a sequence of Holocene silt-clay sediments covering most of the topographic lows and (3) a sequence of highly calcic Pleistocene varved clays of variable thickness occurring mainly in topographic highs. This sequence of sediments underly the other two types by erosional contacts.

The mineralogical composition of these sediments consists mainly of quartz, calcite, feldspars, dolomite, illite, kaolinite, amphiboles and smectite-vermiculite interbeddings. The quartz peak is always the highest but the calcite peak in the varved sediments and the amphiboles and feldspars peaks in the silt-clay sediments reach considerable height. The other peaks are always minor.

The areal distribution of the elements iron, manganese, nickel, copper, zinc, chromium and strontium is affected by both the lithology and water-depth and on this basis, these elements can be divided into four groups:

(1) The iron-group, including iron, copper, zinc and chromium (2) Manganese (3) Nickel (4) Strontium

Relative to average sedimentary rocks, central Nipigon Bay is enriched in manganese, zinc and copper and is depleted in strontium, nickel, iron and chromium. Relative to the surface sediments of Lake Superior, it is depleted in manganese, copper, nickel, zinc and chromium but is enriched in strontium. Relative to the top interval sediments of southern Lake Michigan, it is enriched in chromium, copper, nickel, iron and manganese but is depleted in zinc. Relative to the surface sediments of the Pacific, it is depleted in iron, manganese, nickel and copper.

Strontium is probably camouflaged by calcium in the precipitated carbonates and is hence enriched in the highly calcic varved sediments.

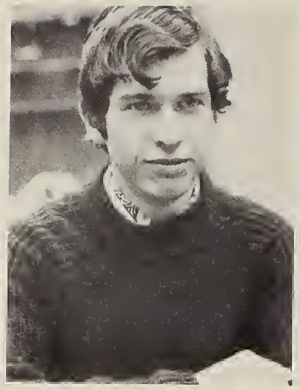
The differences in distribution between manganese and the iron-group of elements is attributed mainly to the difference in stability of their ions and the different rates of post-depositional dissolution and subsequent migration of these ions upwards along solution channels during compaction.

The behaviour of nickel may be due to its affinity to the iron-group of elements on one hand and to manganese on the other.

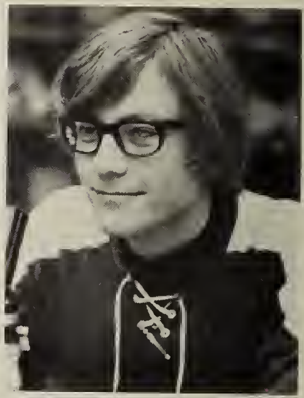
Other factors affecting the distribution pattern may be the different amount of detrital dilution due to different rates of sediment accumulation and to the different concentrations of these elements in Lake Superior.

Patrick Fung

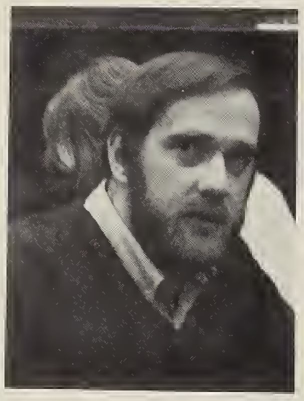
THIRD YEAR



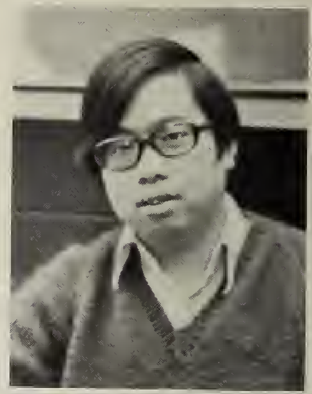
Neil Campling
Interests:
  Paleoenvironmentology
Experience:
  3 Seasons on Archeaological Digs



George Einarson
Interests:
  Petrology and Geochemistry
Experience:
  Summer 1971 - Limnogeological reconnaissance of Lake Superior under Dr. J. Mothersill

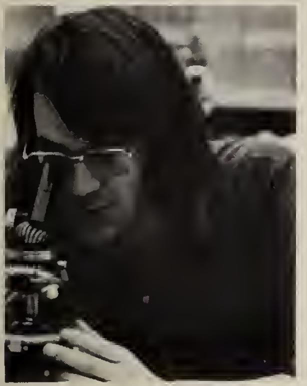


Ron Green
Interests:
  Economic Geology



Tom Hong
Interests:
  Environmental Geology
Experience:
  Lands and Forests

Bob Kyryluk
Interests:
  Geophysics and Music
Experience:
  Prospecting in British Columbia

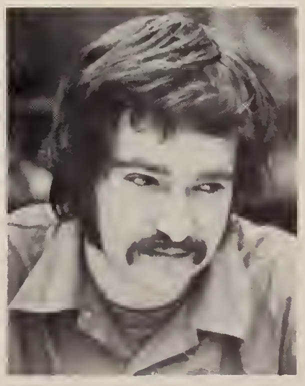


Howard Poulsen
Interests:
Mining Geophysics and Exploration Geology
Experience:
6 years Exploration Geophysics
1 year CJA Ltd.

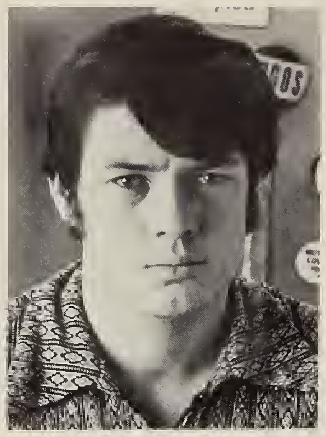
Allan Speed
Interests:
Geophysics
Experience:
2 summers with Great Lakes Nickel Mines
1 summer with Dr. J. Mothersill doing
Limnogeological reconnaissance of Lake Superior

Leslie A. Tihor
Interests:
Photography
Experience:
1 year with Noranda Explorations
3 years with Falconbridge Mines
1 year with the Geological Survey of Canada

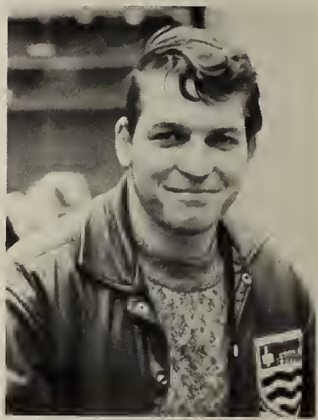
Gord Trimble
Interests:
Economic Geology
Experience:
2 years with Falconbridge Mines



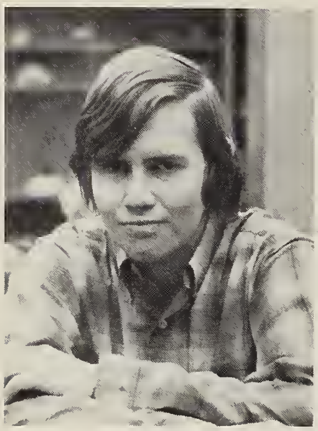
SECOND YEAR



Mike Andrews
Interests:
Economic Geology
Experience:
Summer 1971 - Ontario Department of Mines



Eric W. Brown
Interests:
Structural Geology, Computer Programming
Experience:
Summer 1971 - National Museums of Canada (Wawa)



Ralph Bullough
Interests:
Economic Geology
Experience:
Summer 1971 - Ontario Department of Mines

David J. Busch
Interests:
Geophysics
Experience:
Diamond Drilling

Peter Friske
Interests:
Geochemistry, Skiing, Tennis
Experience:
Summer 1971 - Limnogeological reconnaissance of Lake Superior under Dr. J. Mothersill

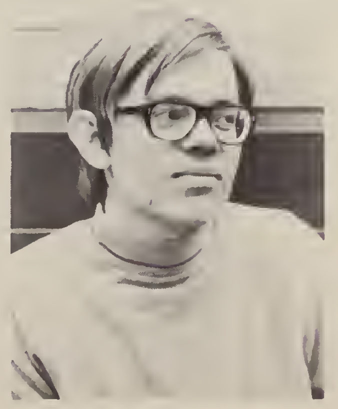
Gary P. B. Grabowski
Interests:
Optical mineralogy, Water-skiing

Bryan L. Heppler
Interests:
Skiing, Skydiving, Environmental Geology

Beth Hillary
Interests:
Geology Field Work, Oceanography, Petrology
Experience:
Summer 1971 - Limnogeological reconnaissance of Lake Superior under Dr. J. Mothersill

Dennis Kwiatkowski
Interests:
Judo, Hunting, Fishing

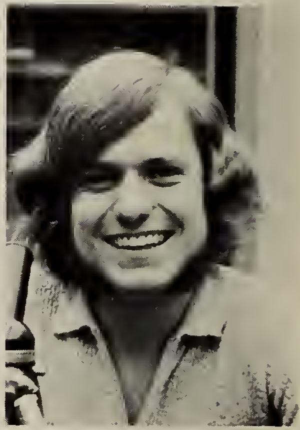
Robert Larsen
Interests:
Scuba Diving, Petrology, Skiing, Squash



Bernard Meyer
Interests:

Experience:
3 Seasons as Junior Assistant with U. D. M.

Paul Nielsen
Interests:
Economic Geology
Experience:
Summer 1971 - Exploration with Mattagami
Lake Mines



David Powers
Interests:
Paleontology, Petrology, Photography
Experience:
Summer 1971 - National Museums of
Canada (Wawa)
- Limnogeological survey
of Lake Superior under
Dr. J. Mothersill

Bob Scott
Interests:
Photography, Fishing
Experience:
Lands and Forests

Mario L. Silva
Interests:
Geochemistry, Swimming, Soccer

Sharon Tihor
Interests:
Leslie Tihor, Volcanology,
Geology in General

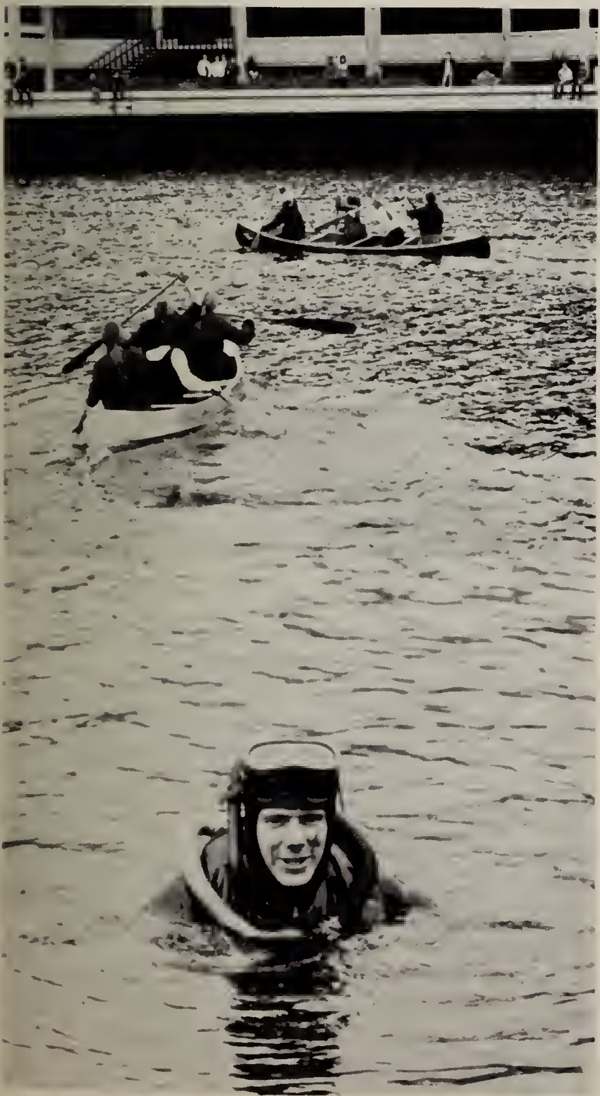
Ron (D. J.) Wrigley
Interests:
Varied - Mostly Shipwrecks

1st YEAR

GEOLOGY MAJORS - FIRST YEAR

BLUCHER, Pierre
CROCKER, Ron
DACIW, Dan
DELGATY, Blake
GALLEY, David
GRUNYS, Al
HODGINS, William G.
JARVIS, Malcolm R.
KLIMASZEWSKI, Michael
KRAUS, Toivo
LOW, Kan
LAU, Anthony
LEE, Yip Wai
MASON, John
PINN, Barry W.
SOGNARJO, Joesman
STEINERT, Gordon
SYVITSKI, James P.
STEWART, Peter F.
SZARABURA, Ken
TAM, Wing Wong
WIEGAND, Tom
YU, Fred
YUMA, Marias
ZAWADOWSKI, Peter

Canoe



Races

Boy those sure are neat rock pictures.

Strike, dip, lineation, strike, dip, lineation, strike, dip, lineation, strike, dip, lineation, strike, dip, lineation, strike, dip....

Well if nothing else we could fish from it.

Now lad that isn't the way to do it at all!

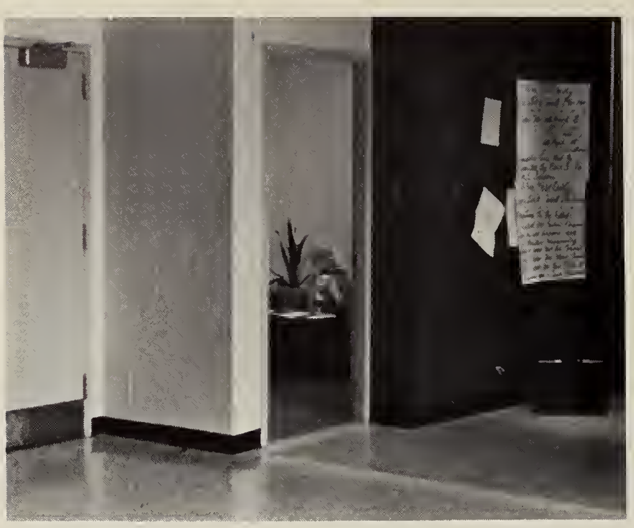
Och laddie, this is a geology cocktail!

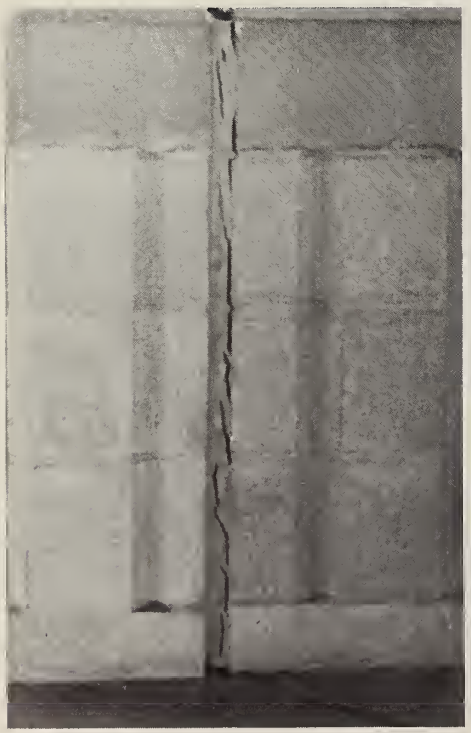
Cuddles

Geology club settles down to business.

Now Brian, then you connect this dot to that dot...

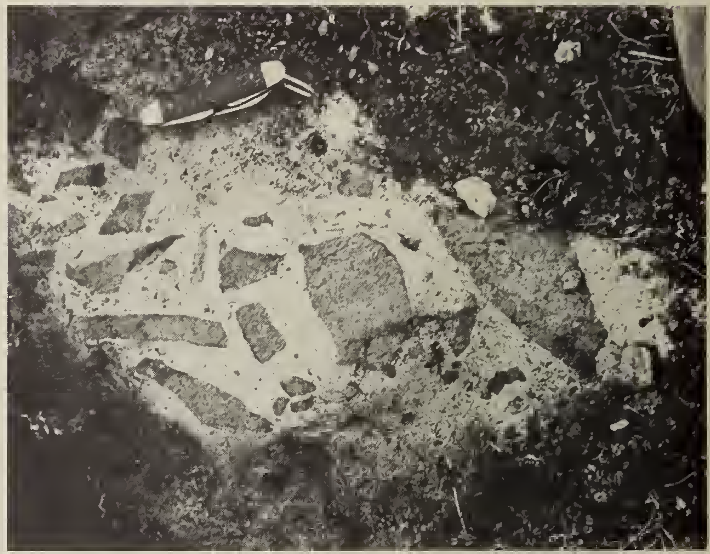
ANOMALIES





BEHIND EVERY ENGINEER IS A GOOD GEOLOGIST.

Intersection of the Kenoran and Hudsonian cleavages



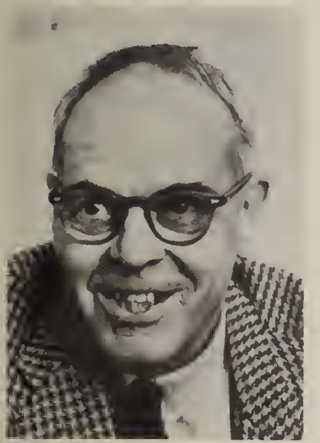
Gabbro xenoliths in granophyre

Weathered surface of extremely course grained meta-pyroxenite

Greywackes near Rankin Inlet, N.W.T.

Guest Lecturers

Dr. Alex Brown
Department of Geological Engineering
Ecole Polytechnique, Montreal
"The White Pine Copper Deposit, Michigan"



Dr. H.V.WARREN
University of British Columbia
"What Canada's Mining Industry Means To Canadians"

Mr. BYRON RICHARDS
A.S.P.G. Distinguished Lecturer 1971
"The Beaver River Anticline And Its' Associated Giant Gas Reserves"

GEOLOGY 71-72

PRINCE

PRINCESS

Dave Powers

Cookie Poirer

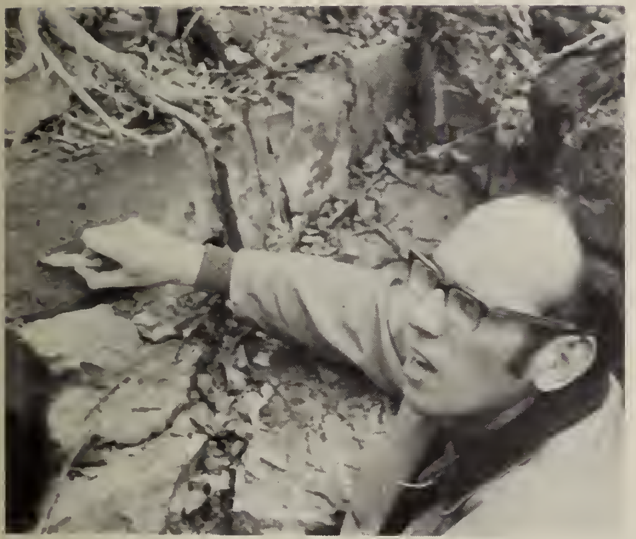
Announcements

THANK YOU

The GEOLOGY CLUB would like to extend their appreciation to the following people whose contributions throughout the course of the year, were instrumental to the success of both the Geology "Year Book" and the Geology Club.

Dr. M. Kehlenbeck	Professor Lakehead University
Dr. R. Greggs	Professor Queen's University
Mrs. Jean Helliwell	Secretary, Geology Department
Mr. Sam Spivak	Draftsman, Geology Department
Miss Cookie Poirer	Geology Princess
Miss Brenda Cooper	Social Director
Miss Susan Turnbull	Student
Miss Sandy Duncan	Student
Miss Brenda Duncan	Student
Miss Lorna Niemi	Student
Mr. Larry Ovifrichuk	Artist
Mr. G. Hashiguichi	Biology Photographic Technician

and to all members of the Geology Department too numerous to mention.



GEOLOGY FIRST YEAR FIELD TRIP

This year, the first year geology students had two opportunities to visit local areas of geological interest. In most instances the sites we visited were natural occuring examples of what we would be presented with in the geomorphological portion of the course this year.

Accompanying us on the trips were Dr. Mercy, Dr. Mothersill, Dr. Franklin, and Dr. Kehlenbeck as well as several upper year students. The purposes of the trips were to give us an over all general idea of the geology of the area around Thunder Bay, which proved valuable to students from southern Ontario as well as to examine some specific examples of bedding, dikes and unconformities.

Our first stop on the Sibley group field trip was at the site of the Wolf River. Here Dr. Mothersill and Dr. Franklin pointed out the sequences of varved clays in the sedimentary bedding through which the Wolf River has cut. Our next stop was at the Enterprise Mine. Here we saw lead, zinc and silver ores. We also saw sandstone beds underlaid by Precambrian rock, a difference of 1.9 billion years between the two rocks. The group was then taken to Pass Lake on Sibley Peninsula. This brought us to an exposed basal unit of the Sibley Group which is comprised of polymictic and conglomerates. We saw, also, a well-defined contrast zone between the conglomerates and sandstone. The last point of interest was a quarry composed of black Rove shale overlying a Gunflint Formation. Embedded within the Rove shale were large irregular carbonate concretions, possibly of organic origin.

The second trip on October second, despite the rainy weather was participated in by about thirty students. The first stop of the day was at the spillway of the Kakebeka Falls Hydro Station. Because of the excavation it produced the best exposure of Gunflint tuff-argillite in the area. Here we noted a fault with strike parallel to the face of the spillway cut. This site afforded an excellent opportunity to students who wished to collect samples as the area was abundant in pyrite nodules embedded in the chert as well as pyrite veins. Areas of shale, limestone, tuff, greywacke and chert beds were also closely observed. Close examination also revealed anthroxolite in veins.

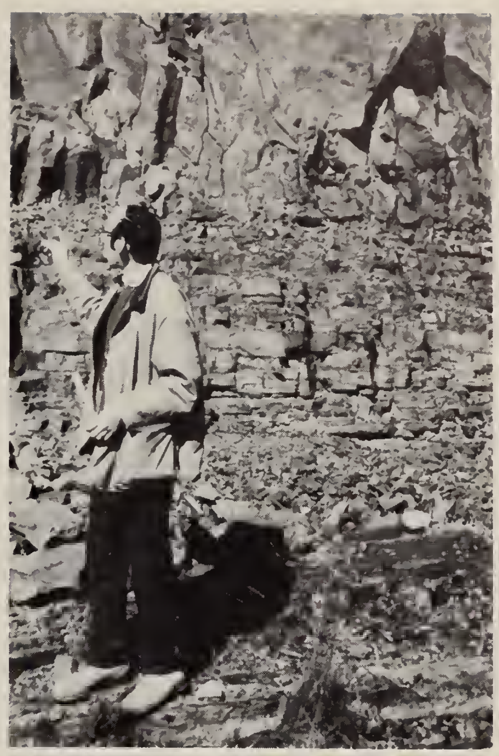
Our next stop at the Falls proper revealed a resistant chert-limestone cap which protected the underlying shales from erosion due to the Falls. Approximately one-half mile upstream from the Falls we examined the point of contact between the Gunflint Formation and the older granite.

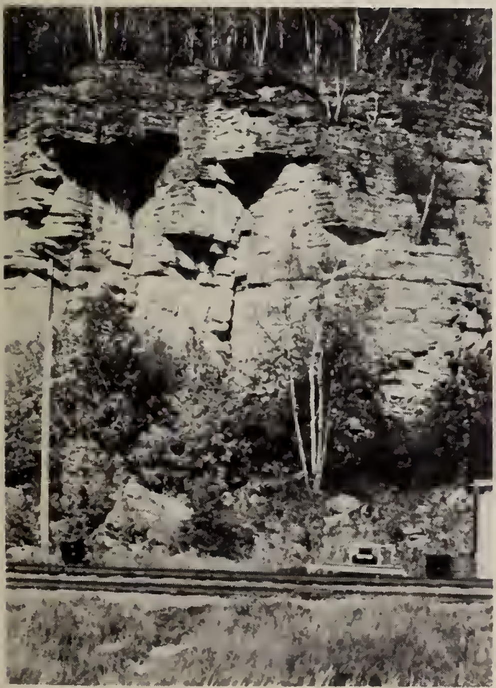
Next we proceeded to the point at which the Whitefish River crossed the road. A short distance down stream we examined a unconformity between older granodiorite (igneous intrusive rock) containing plagioclase and amphibole, and the Gunflint Formation. At this point chert mounds overlying the very thin basal conglomerate were observed. The chert mounds were believed formed from very primitive algae.

Proceeding south we came to the Pigeon River Middle Falls area. Here a gabbro dike in Black Rove shale has produced an obstruction at right angles to the river movement which is resistant to water erosion resulting in the Falls. These black shale formations contained carbonate minerals believed to be of organic origin 1.65×10^{10} years old. Proceeding back to Thunder Bay we passed through the range of eroded mountains called the "Norwesters", of which Mount McKay is an example. These mountains are formed of black shale of the Rove Formation and are capped by a diabase layer about 200 feet thick. The diabase which is resistant to erosion prevents the shale from being eroded, reducing the mountains to a vertual peneplain.

As the year proceeded, we were better able to comprehend the forces which produced and are destroying these features which we examined. We could also better comprehend these features as they naturally occurred, which were set out rather idealistically in the course proper.

Barry Pinn,
First Year Geology Student.





FORESTRY
MAP
PUBLISHED BY THE GEOLOGY DEPT.
Larry 71

Printed by Inter-Collegiate Press of Canada (1971) Ltd

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